The Systemic Position of the Genus *Tricophyton* Malmsten 1845.

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Introductory.—As a rule no mention of the genus *Tricophyton* is to be found in the larger works on Fungi, or if it is found it is used only as a synonym. Thus Saccardo, in vol. xviii of his "Sylloge Fungorum," has an *Index Universalis Cohortium, Familiarum, Subfamiliarum, Generum, Subgenerum, atque Synonymorum præcipuorum in toto opere* (vol. i, xviii) *expositorum*, in which, on p. 833, is printed :—

Tricophyton Malmst = Sporotrichum Link.

When so great an authority as Saccardo publishes a statement of this nature in the year 1906, no further excuse is necessary for bringing forward any facts which may elucidate the systemic position of Malmsten's genus *Trichophyton*.

Historical.—In 1844 Gruby discovered the parasite of ringworm, and this was verified in 1845 by Malmsten, who proposed two generic names for the new fungus, *i.e.*, "Trichophyton" or "Trichomyces," and one specific name "Tonsurans." The first generic name has become established and the genus, the systemic position of which we are about to review, is now known as *Trichophyton* Malmsten 1845 ; very often the date given is 1848, which is that of the publication of the German translation and not the date of the original Swedish work, the name being derived from θρίξ, hair, and φυτόν, a plant.

Malmsten believed the genus *Trichophyton* to be closely related to the genus *Torula* Persoon 1801, and especially to the species *T. olivacea* Corda 1837 and *T. abbreviata* Corda 1837.

This relationship was adopted by Charles Robin in his celebrated work "Histoire Naturelle des Végétaux Parasites," published in 1853. His classification is as follows : Fungi : Division, *Arthrosporei ;* Tribe, *Torulacei ;* Genus, *Trichophyton* Malmsten.

We have been unable to refer to Malmsten's original paper, but it is not difficult to understand the reason why, in 1845, he believed *Trichophyton* to be allied to *Torula* Persoon 1801.

In 1886 Hallier regarded the relationship to be closely allied to the genus *Penicillium* Link 1809.

In 1875 Grawitz made a new assertion, claiming that the relationship was with *Oospora* Wallroth 1833, a view which was adopted by Baumgarten in his "Pathologischen Mykologie" in 1890.

Later researches by Duclaux in 1886, by Verujsky in 1887, and still later by Sabouraud, indicated that some of the species should be classified near to *Sporotrichum* Link 1809, which suggestion has been adopted by Saccardo in his "Sylloge Fungorum," though he goes further, making *Trichophyton* merely a synonym of *Sporotrichum*.

Bodin (1899-1902) brought forward views tending to show that the relationship is complex, some of the species being allied to *Endoconidium* Prillieux and Delacroix 1891 (a genus which lately disappeared, having become *Stromatinia* Prillieux 1897) while other species were held to be more closely related to *Acladium* Link 1809 and to *Haplaria* Link 1809. These views are based upon a study of the sporulation and indicate that *Trichophyton* is a genus belonging to Fuckel's Class *Fungi Imperfecti*, and, adopting the older methods of classification, to the Subclass *Hyphomyceteæ* Martius 1817, the Family *Mucedinaceæ* Link 1809, Subfamily *Amerosporeæ* Saccardo 1886, Tribe *Macronemæ* Saccardo 1886, and Subtribe *Botrytidæ* Saccardo 1886.

Vuillemin's recent classification places the genus under the Order *Thallosporales*, Suborder *Arthrosporales* Vuillemin 1910, and allies it with *Mycoderma* Persoon 1822, *Madurella* Brumpt 1905, *Indiella* Brumpt 1906, *Epidermophyton* Lang 1879, *Microsporum* Gruby 1843, *Achorion* Remak 1845, and *Trichosporum* Behrend 1890.

In June, 1899, Matruchot and Dassonville published a paper entitled "Sur la position systematique des Trichophytons" and followed it later in the same year by another paper entitled "Sur le *Ctenomyces Serratus* (Eidam) comparé aux Champignons des teignes." Briefly stated, their view is that the genus *Trichophyton* Malmsten 1845, belongs to the *Ascomycetes* of De Bary if this is taken to include *Hemiascomycetes* of Brefeld. In either case, whether these classifications or Schröter's more detailed arrangement of the Ascomycetes be adopted, does not concern our present purpose as both contain the family Gymnoascaceæ (often written Gymnoasceæ) in which Matruchot and Dassonville place the genus *Trichophyton*.

Their reasons for this classification are :

(1) *Ctenomyces serratus* Eidam 1880 is a fungus found on the feathers of birds which, when cultivated on Sabouraud's proof media, produces

growths strikingly analogous to those of species of Trichophyton.

(2) *Ctenomyces serratus*, when inoculated into animals, gives rise to lesions resembling a *Trichophyton* eruption in which it appears in a filamentous form.

(3) A fungus closely resembling a Ctenomyces, which they found in a ringworm in a dog, when cultivated gave rise to perithecia. For this fungus they created a new genus *Eidamella* Matruchot and Dassonville 1901, calling the given species *Eidamella spinosa* Matruchot and Dassonville 1901.

Against this view Sabouraud has pointed out that in the cultures of this fungus they found intercalary chlamydospores, but neither fusiform bodies nor the conidia usually seen in Trichophyton cultures, and therefore he considers their demonstration to be still incomplete.

To summarize, Matruchot and Dassonville have brought forward considerable evidence to support the view that the genus *Trichophyton* Malmsten 1845 belongs to the family *Gymnoascaceæ* Baranetzky 1872 of the Ascomycetes, but as so great an authority as Sabouraud does not accept their proofs as final there is obviously an opening for further observations, especially as no proof of such a classification has, up to the present, been brought forward with regard to a Trichophyton obtained from man.

Trichophyton currii.—In a previous paper published during the present year in this Journal we have given an account of a Trichophyton Endothrix which we found to be the common ringworm on the heads of schoolboys in Khartoum and Omdurman and to which we gave the name *Trichophyton currii* Chalmers and Marshall 1914.

In this paper we gave photographs of the parasite, its cultures and the disease which it produced, and therefore do not consider it necessary to repeat that which we have so recently written and depicted, except to state that in liquid media the conidia are formed in masses.

It will be seen by reference to our previous paper that the growth formed by *T. currii* on Sabouraud's maltose agar is white, but if the culture is kept for several months it gradually becomes black.

If the growth produced at atmospheric temperature (average about 100° F.) in one of Kitasato's flasks, *i.e.*, in a thin layer of the medium, is examined posteriorly a number of small black dots may be seen. These dots resemble in size the head of a fine entomological pin, that is to say about 0·5 mm. on the average (*vide* fig. 1) although some few appear to be larger.

When a small one is separated out and examined, it shows the appearance depicted in fig. 2, where it will be seen to be a rounded body composed of interlocked hyphæ with thickened greenish-black walls.

On section the structure shows the appearance depicted in figs. 3 and 4, on examination of which it will be noted that there is an outer wall composed of the interlocked hyphæ mentioned above, while the contents show hyphæ and cells the spaces between which are filled, in the fresh condition, with a fatty material.

If a black dot is teased or broken and examined in a fresh state it will be observed how easily the outer wall is separated into its component hyphæ and also that the contents are simply fatty material and ovoidal bodies (*vide* fig. 5) composed of a double contoured wall and clear hyaline cytoplasm.

The black dots appeared first when the cultures were about two months old, a length of time probably equal to a year's growth at atmospheric temperature in Europe, but at the time of writing they are nearly seven months old and consist of only the outer wall, the contents having all disappeared.

When they, in their younger condition, with some of the surrounding hyphæ were planted on Sabouraud's or other media, typical trichophytic growths were produced apparently indistinguishable from those originally obtained from the hair. Inoculated into animals they gave no better results than that produced by inoculations direct from a patient's head or from fresh cultures.

Such in brief is the description of the bodies the nature of which we are now about to discuss.

Discussion.—The structure and appearance of the black dots confirm us in the view that they are *Perithecia*. Further, the fact that they are simply composed of interlocked hyphæ indicates that the fungus giving rise to them belongs to the Hemiascomycetes and to the family Gymnoascaceæ Baranetzky 1872.

Their origin appears to us to be simply thickened hyphæ wrapped around other hyphæ which break up into fatty bodies and the ovoidal bodies mentioned above. These ovoidal bodies are, in our opinion, asci which have failed to produce ascospores, nor is the reason of this difficult to understand, as it is simply a stage of the adaptation from the saphrophytic, or the parasitic, existence on a plant to the more perfect parasitic condition on a man.

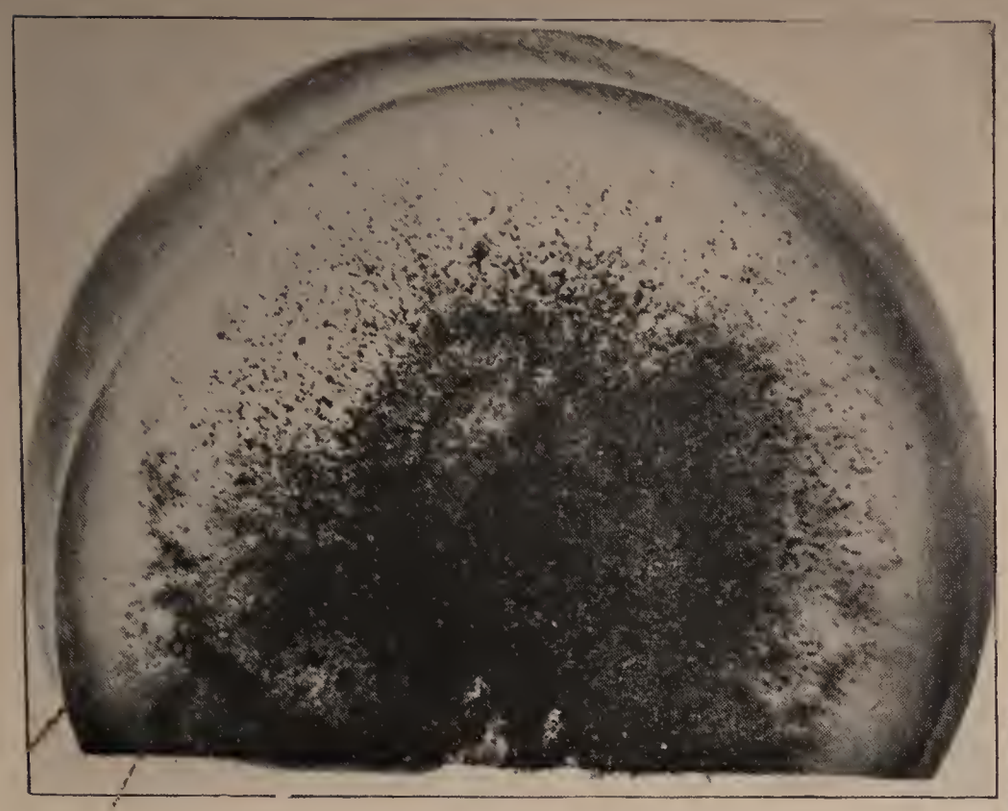
Classification.—If we are right in our conclusions given above then *T. currii* would belong to Baranetzky's family Gymnoascaceæ which already contains the genera :—

Amauroascus Schröter 1893.
Arachniotus Schröter 1893.
Ctenomyces Eidam 1880.
Eidamella Matruchot and Dassonville 1901.
Gymnoascus Baranetzky 1872.
Myxotrichum Kunze 1823.

Moreover, our observations and deductions remarkably agree with, confirm and support the admirable researches of Matruchot and Dassonville with whom we are in entire concord.

Evolution.—We are further of the opinion that *Eidamella spinosa* of Matruchot and Dassonville 1901, indicates the least specialized form of Trichophyton known, in that it develops ascospores in the asci. *Trichophyton currii* appears to us to have advanced a step further along the line of parasitic adaptation in that it has ceased to develop the ascospores, and, moreover, has begun to develop fusiform bodies and spiral loops.

In the evolutionary tree depicted in our previous paper we indicated that *T. currii* was closely related



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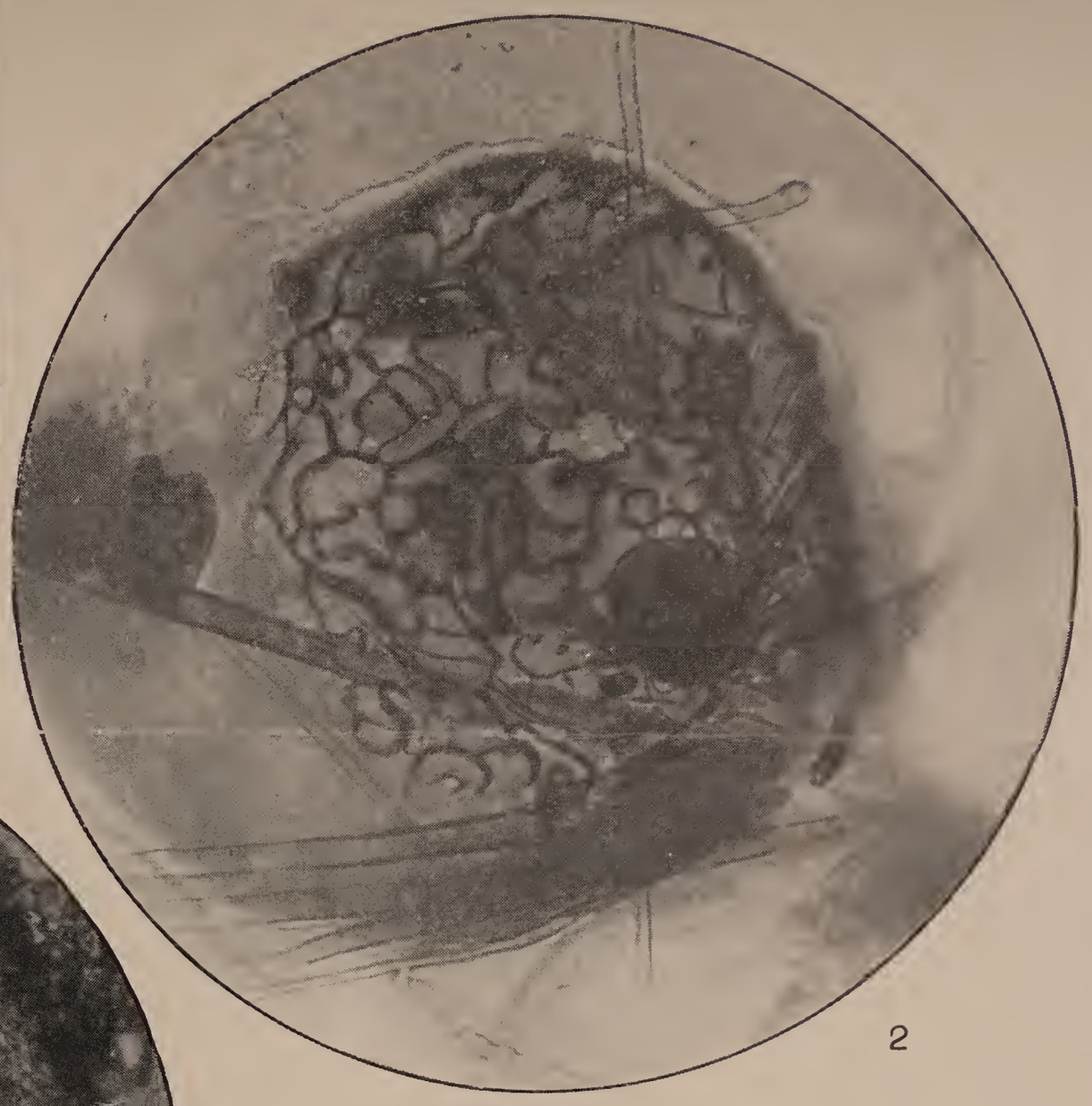

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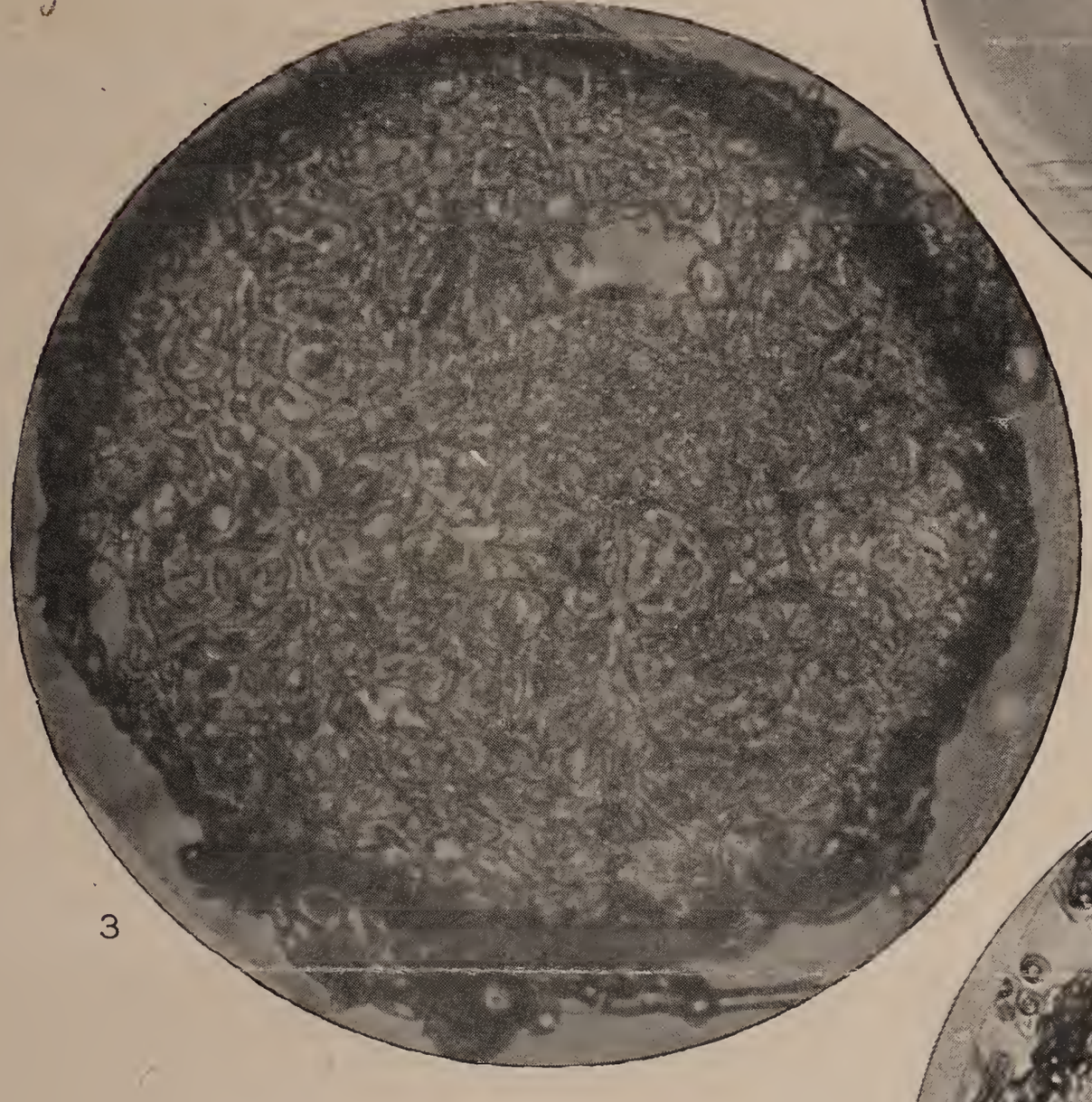

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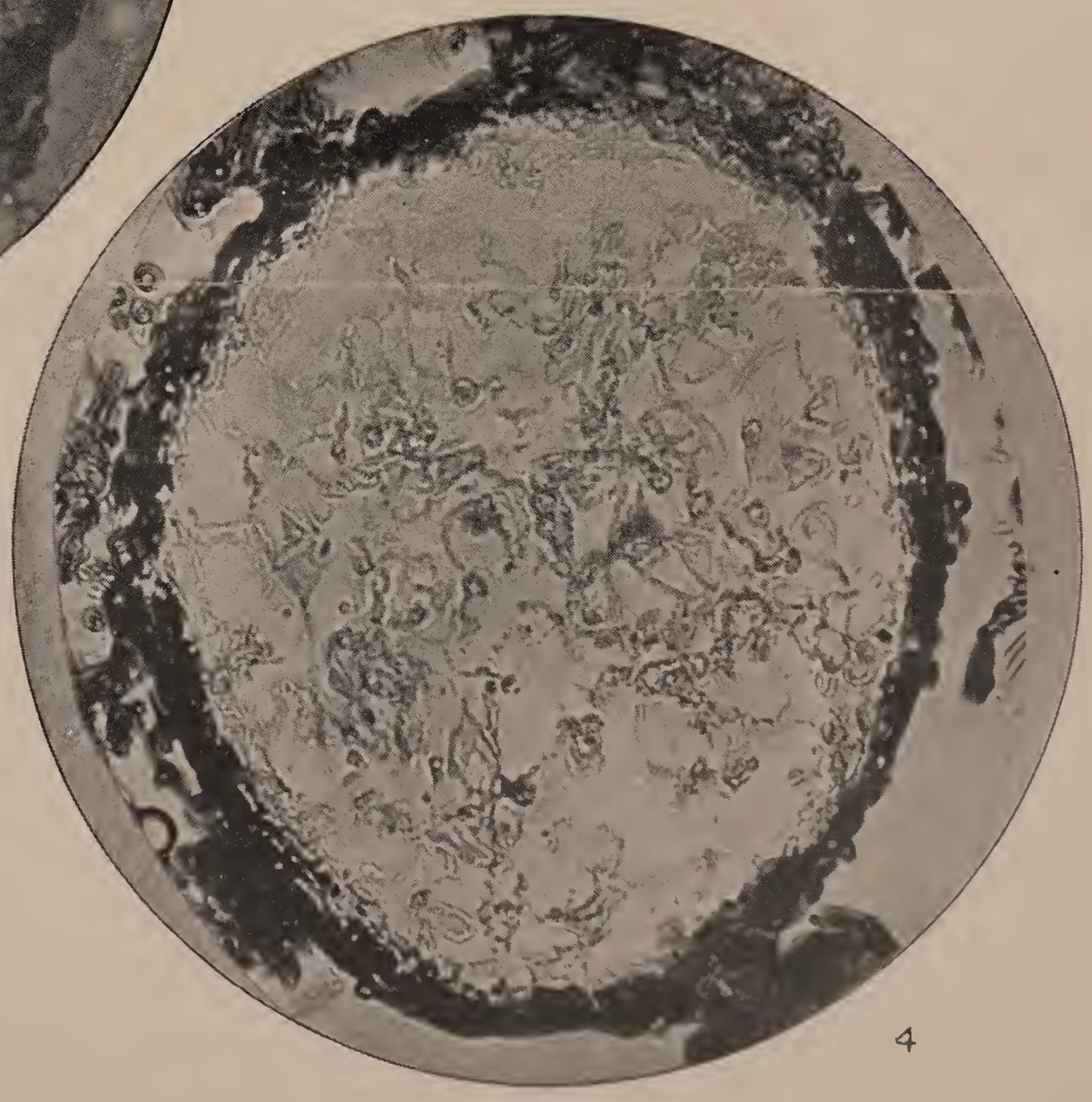

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To illustrate article, "The Systemic Position of the Genus *Trichophyton* Malmsten 1845," by Albert J. Chalmers, M.D., F.R.C.S., D.P.H., and Alexander Marshall.

to the main stem of the Trichophytons, and this was one of the reasons of our doing so, though we did not mention it in that paper. Moreover, in the same paper we gave reasons for considering that *T. currii* was closely related to a possible parental form of the Crateriform and the Acuminate groups of the Endothrix division of the genus *Trichophyton*.

In our opinion a step further in parasitic existence is indicated by the appearance in the cultures of *T. currii* of a very few spindle-shaped bodies and a few spirals. In our opinion the spirals indicate an attempt to form a perithecium. In this view we differ from other observers who consider them to represent merely ornaments on the outside of the perithecium. Our contrary opinion is based on the fact that the perithecia of *T. currii* do not show ornamentation, and we therefore consider the spiral bodies to represent not merely the ornamentation but the whole wall of the perithecium.

With regard to the septate spindle bodies we are not in a position to make any definite statement, though we incline rather to the view that they represent an attempt to form asci than that they are related to the chlamydospores.

If we are right in our opinions then some of the peculiar features of *Trichophyton* morphology are explicable.

Conclusion.—We believe that the genus *Trichophyton* Malmsten 1845 belongs to the family *Gymnoascaceæ* Baranetzky 1872 which is included in either Brefeld's *Hemiascomycetes* or De Bary's *Ascomycetes*, according to the form of classification adopted by the reader.

Khartoum,
July 18, 1914.

List of Illustrations.

These illustrations are much improved if examined by means of a lens.

Fig. 1.—Photograph of a culture of *Trichophyton currii* Chalmers and Marshall 1914, about seven months old, on Sabouraud's maltose agar in one of Kitasato's flasks and taken from the back. Note the small black dots. Fresh preparation. Natural size.

Fig. 2.—Photomicrograph of one of the small black dots as seen in fig. 1, but taken from a culture when only two months old. Surface view of a fresh preparation. × 1,300 diameters.

Fig 3.—Photomicrograph of a section of one of the small black dots as depicted in fig. 1, but taken from a culture about four months old and preserved so as to show the fat bodies *in situ*. Unstained. × 1,570 diameters.

Fig 4.—Photomicrograph of a section of one of the small black dots shown in fig. 1, but with the fat dissolved out of the specimen. Stained by the Oxford method. × 800 diameters.

Fig. 5.—Photomicrograph of one of the ovoidal bodies obtained by teasing out the contents of a black dot and staining by the Oxford method. × 1,140 diameters.

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Arranged in alphabetical order.

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